OUTDOOR PIG BREEDING SYSTEMS FOR GROWING AND FATTENING PHASES

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ABSTRACT

The experimental outdoor pig farm is situated in the South of Italy (Crotone). The enclosures for the pig breeding were dimensioned to keep 12-14 pigs/each (100 m^2/head) and were arranged with a hopper trough, a drinker, a water nozzle, a hut with insulated roof (covered surface of 10 m^2) and a shading net. The huts were located on the ground with different expositions of the open side (West and East), in two close fences.

During the trials pigs of Large White breed in growing phase were reared. Microclimatic and behavioural parameters were collected both in winter and in summer.

The values of air temperature and contact temperature inside the two huts were very close to the outside temperature. In winter the average air temperature was higher in the hut with West open side (13.4°C vs. 11.0°C), with relative humidity lower on average. In summer the average air temperature was higher in the hut with East open side (1.4°C; 27.1°C vs. 25.7°C) and relative humidity levels almost equivalent.

Concerning the behavioural data, during the winter season the pigs devote the 83% of the time to resting, especially inside the huts (80%). Only the 3% of the resting time is registered outside. The 17% of the time is spent for outside activities. During the summer the animals spend the same time (83%) for resting, but they use less the hut (only 62% of resting time inside the hut).

The 83% of the time destined to resting both in winter and in summer season can be considered as indicative of good welfare conditions, taking into account that in outdoor enclosures the pigs can satisfy instinctive behaviours such as rooting and exploring.

In conclusion: a) the huts used during the trials enable to mitigate the outside temperatures in a rather limited way; b) in winter season it is advisable to arrange a partial closing of the open side and to use great amounts of straw; c) the open side exposed to West gives a better thermal comfort to the pigs, related to East exposition, both in winter conditions and in summer conditions.

KEY-WORDS: Outdoor pig production, animal welfare, sustainable breeding, growing-fattening phases, heat protection.

INTRODUCTION

The outdoor pig breeding is especially used in the reproductive phase, but can be also applied for the pigs in the growing-fattening phase; in recent years in Europe the outdoor system has been adopted by conventional farms and also by organic farms in order to comply with European rules.

Outdoor pig production offers clear advantages compared with indoor systems. In some cases these advantages have been realized in terms of prizes for niche market products. Moreover the Council Regulation (EC) 1804/1999 on organic production of agricultural products includes specific requirements about pig housing; first of all the pigs must have access to pasturage or an open-air exercise area or open-air run.

The capital costs of outdoor systems are significantly lower than the indoor systems while the production costs are quite similar. Equipment costs for outdoor production are in the order of 20-30% excluding the value of the land. Therefore outdoor pig farming may be prifitable and attractive for farms supplied with low cost and suitable land.

In Italy this kind of farms are sited principally in the hills and mountain areas of the central and southern regions. However, compared to indoor breeding, the outdoor pig breeding can cause a higher exposition of the pigs to heat stresses, with negative effects on welfare and health, as well as on productive performances.

A few studies have been carried out comparing the outdoor system and the indoor system for growing-finishing pigs. They agree in confirming worse productive performances for the outdoor system in terms of lower daily live-weight gain and higher feed intake/gain ratio (Lee *et al.*, 1995).

The literature contains many studies of the behaviour of pigs. Most of them are focused on the behaviour of pregnant sows (Jeppson *et al.*, 1980; Carter and English, 1983; Broom *et al.*, 1995). The studies take into account the pigs' daily routines and in particular the periods of rest and activity. The rest periods appeared to be greatly influenced not only by the housing system but also by microclimatic conditions and the physiological state of the pigs. The bibliography gives average rest values of approximately 70-80% for sows in groups (Meunier-Salaün and Dantzer, 1990). A study focused on growing-finishing pigs pointed out rest values in indoor housing systems of 90% for conventional system and of 91% for kennel system (Morris and Hurnik, 1998). In a recent research carried out in 10 traditional Italian pig farms, Barbari (2002) has found a wide range in resting times of growing-finishing pigs (77.0 – 92.4%), in relation to the housing systems and the age of the animals.

This study was directed to test welfare conditions and performances of growing-finishing pigs in an outdoor farm of the South of Italy.

MATERIALS AND METHODS

In the present study microclimatic and behavioural parameters were collected in an experimental outdoor pig farm situated in the South of Italy, in the province of Crotone, at an altitude of about 100 m above sea-level (latitude 39°11'N, longitude 4°11'E).

The enclosures for the pig breeding were sited on flat land, rectangular shaped and dimensioned to keep 12-14 pigs each (100 m^2/head). Each enclosure was arranged with a hopper trough, a drinker, a water nozzle, a hut with insulated roof (covered surface of 10 m^2) and a shading net (shaded area of 16 m^2).

During the trials pigs of Large White breed in growing-finishing phase were reared starting with live weights of about 40 kg and finishing with live weights of about 140 kg; the pigs were fed *ad libitum* with complete

feed. Two production cycles were carried out: the first from September 2000 to February 2001, the second from July 2001 to January 2002.

During the first cycle the live weights of 31 heads and their feed consumption were measured at the start, during the cycle and at the end in order to point out growth and feeding performance.

The microclimatic data of temperature and relative humidity were collected in winter and summer season by probes connected to a data logger and installed outside and inside two fattening huts (fig. 1).

The huts are built with a galvanised steel frame supporting the roof of polyurethane sandwich panels (thickness 400 mm) and sidewalls of waterproof wood (fig. 2). The huts were located on the ground with different expositions of the open side (West and East), in two close fences.

The data logger recorded the lowest, the highest and the mean values of air temperature and humidity; contact temperatures of roofing inside the huts were recorded only during the winter season. Microclimatic data were recorded in winter from 3rd to 11th February 2001 and in summer from 27th August to 8th September 2001.

The survey of the behavioral parameters of one group of pigs (14 pigs in winter and 12 pigs in summer) was carried out with the aid of a closed circuit television camera with time-lapse recorder. The recorded video allowed us to measure the time spent by pigs in the hut (resting) and outside in the functional areas resting (lying down) or in standing activity (e.g. eating, drinking, rooting). Every ten minutes the pigs were counted inside the hut and outside resting or in activity. Behavioural data were recorded in winter from 18th to 30th January 2001 and in summer from 25th August to 8th September 2001.

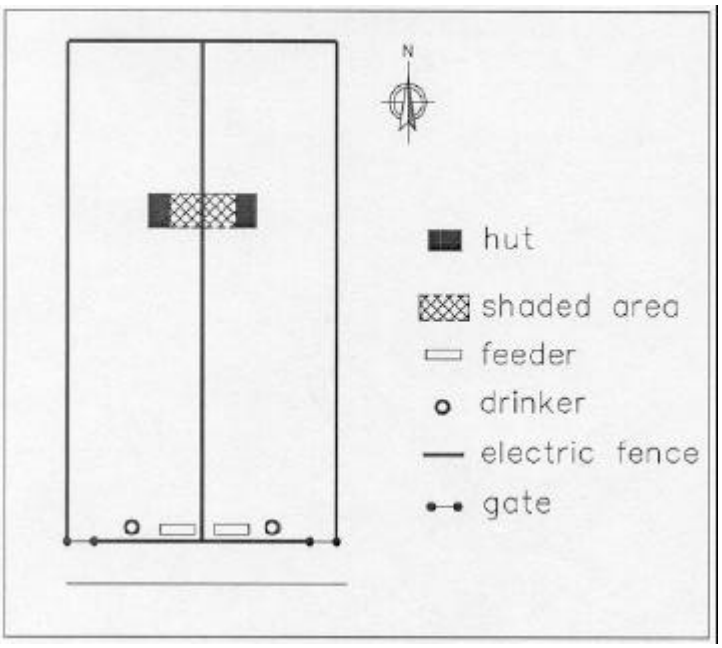


Fig. 1: Plan of experimental enclosures

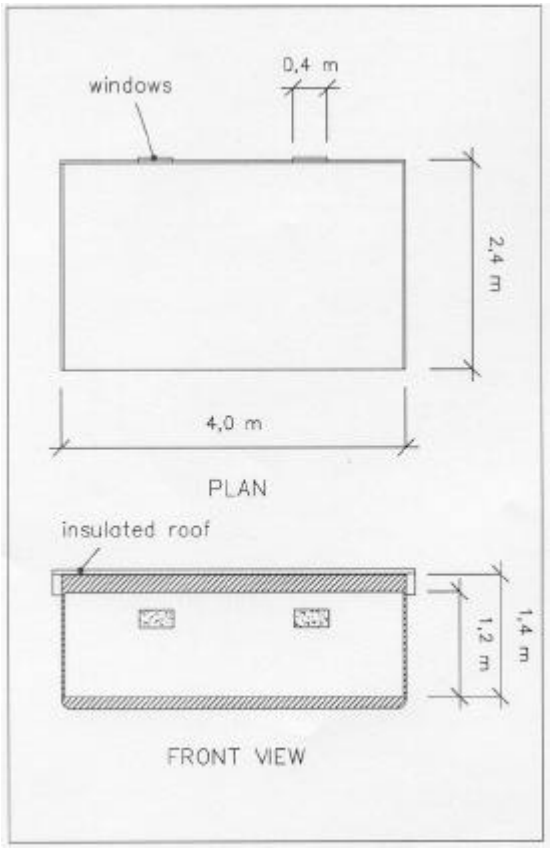


Fig. 2: Plan and front view of the hut

Fig. 3: View of the experimental enclosures

RESULTS AND DISCUSSION

Pigs raised in the first production cycle showed the following performances:
- average daily live weight gain: 0.65 kg;
- feed intake/gain ratio: 4.2.

These results are calculated with reference to starting live weights of 47.4 kg and to final live weights of 143.9 kg on average.

The values of air temperature and contact temperature inside the two huts with different bearing of the open side (West and East) were very close to the outside temperature. The air temperature outside the huts ranged from 1°C to 27°C during the wintertime trials and from 14°C to 41°C during the summertime trials.

In winter the air temperature was higher on average in the hut with West open side (13.4°C vs. 11.0°C), with relative humidity lower on average (68% vs. 82%). Figure 3 shows the daily trends of temperatures in the "typical winter day" (7th February 2001), i.e. the most representative day of the winter period. The typical day is the real day of the period more similar to the theoretic day formed by the means of the hourly values of outside air temperatures measured during the period.

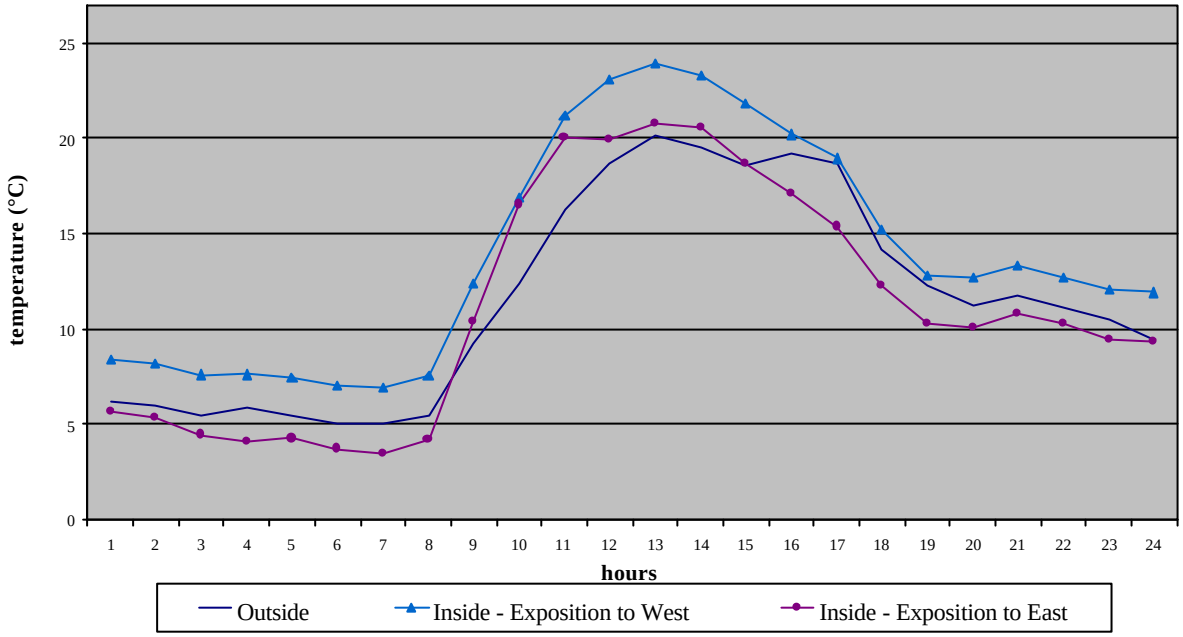
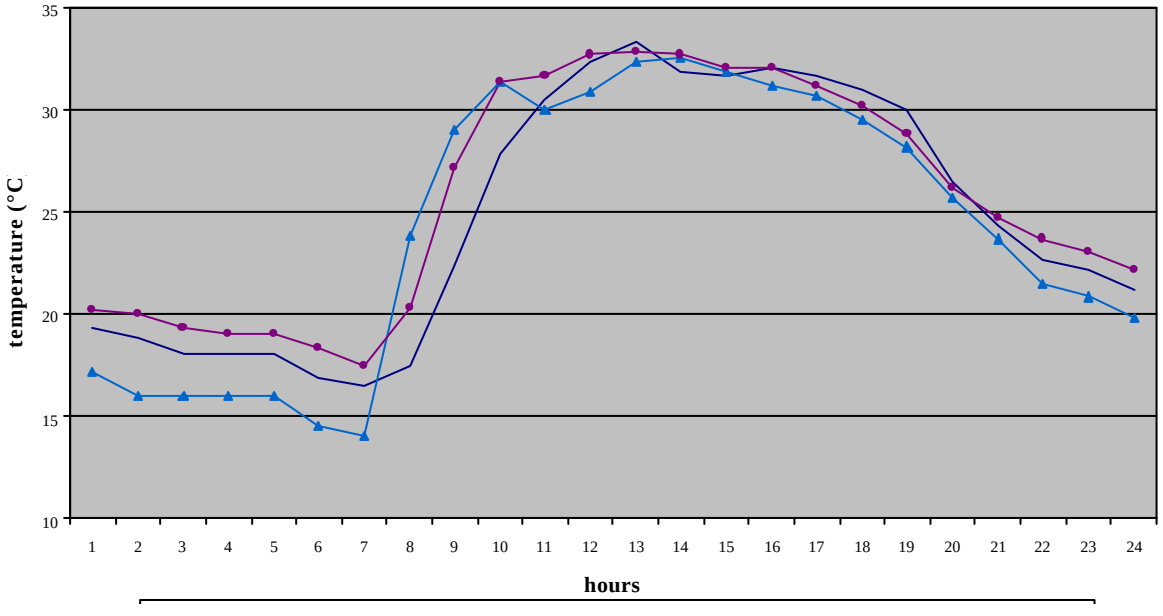


Fig. 3: Daily trends of temperatures in the typical winter day

Fig. 4: Daily trends of temperatures in the typical summer day

In summer the air temperature was higher on average in the hut with East open side (1.4°C; 27.1°C vs. 25.7°C) and the relative humidity levels almost equivalent on average (45% vs. 48%). In figure 4 the daily trends of temperatures are shown in the "typical summer day" (4th September 2001).



Concerning the behavioural data, during the winter season the pigs devote the 83% of the time to resting, especially inside the huts (80%). Only the 3% of the resting time is registered outside (fig. 5). The 17% of the time is spent for outside activities.

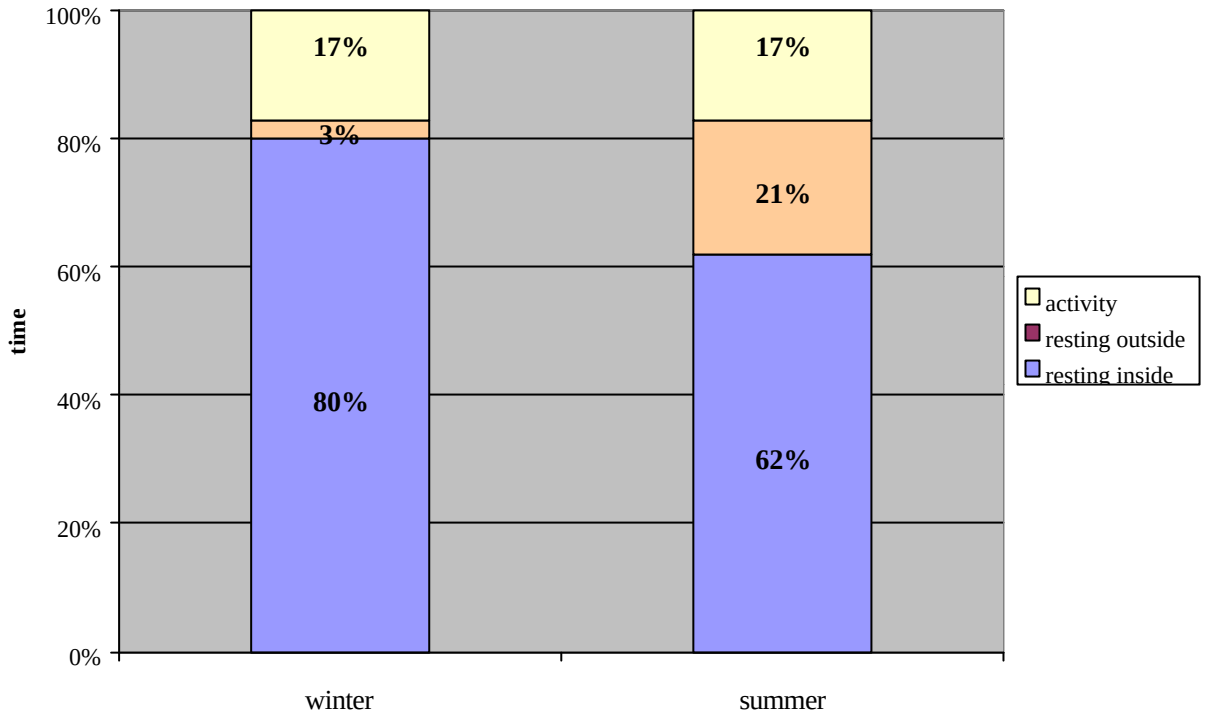


Fig. 5: Time spent for resting and activity behaviours

During the summer the animals spend the same time (83%) for resting, but they use less the hut (only 62% of resting time inside the hut) and prefer to stay in the shaded area during the daytime.

Figures 6 and 7 show the daily trends of time for resting and for activity in the typical behavioural winter and summer days, respectively (18th January 2001; 7th September 2001). The typical behavioural day is the real day of the period more similar to the theoretic day formed by the means of the hourly values of presence of pigs resting and in activity outside and inside the huts, counted during the period.

In winter the activity of pigs is more concentrated in the daytime hours (from 10 to 18), but also during the night single heads are used to access to the feeding-drinking area.

During the warmest daytime hours (from 10 to 16) one or two heads prefer resting outside. In summer the activity is concentrated in the daytime hours, principally in the early morning, from 7 to 10, and in the late afternoon, from 18 to 20. During the night time all the pigs rest in the hut from 22 to 5. During the hottest daytime hours, from 8 to 19, about 50% of the pigs (25 - 75 %) rest outside principally in the shaded area.

Basically the activity of pigs is concentrated principally near the hut and in the feeding-drinking area where they also rest; however pigs have been observed to use all the surface of the enclosure for exploring and rooting activities.

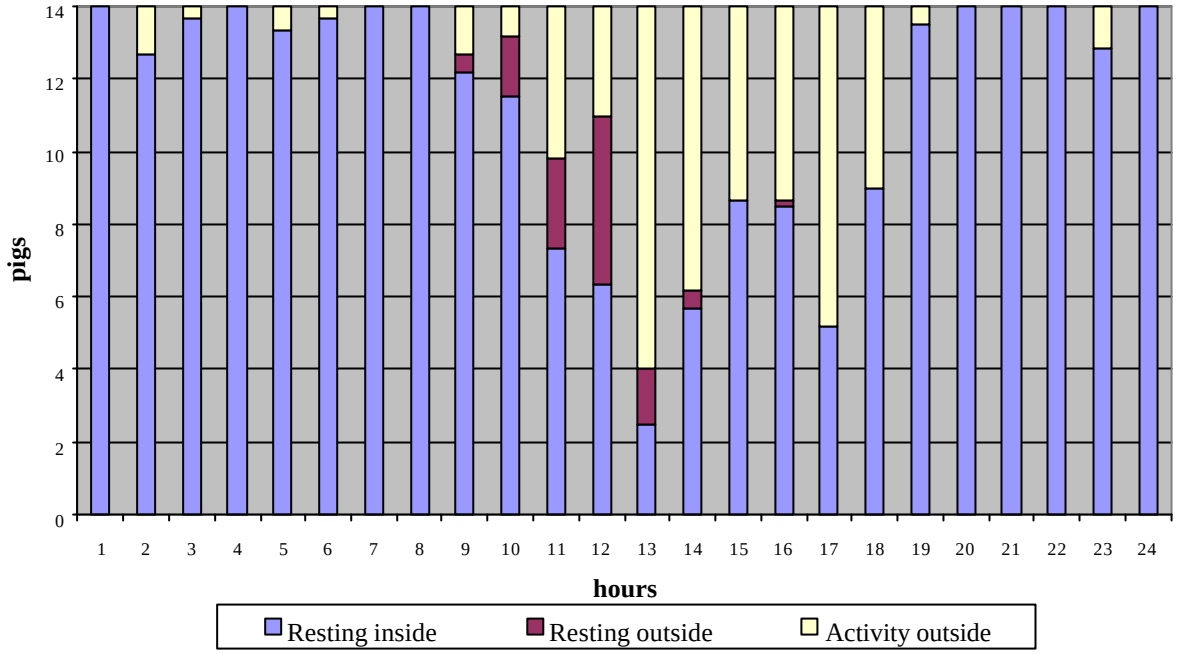


Fig. 6: Daily trends of the number of pigs resting and in activity in the typical behavioural winter day

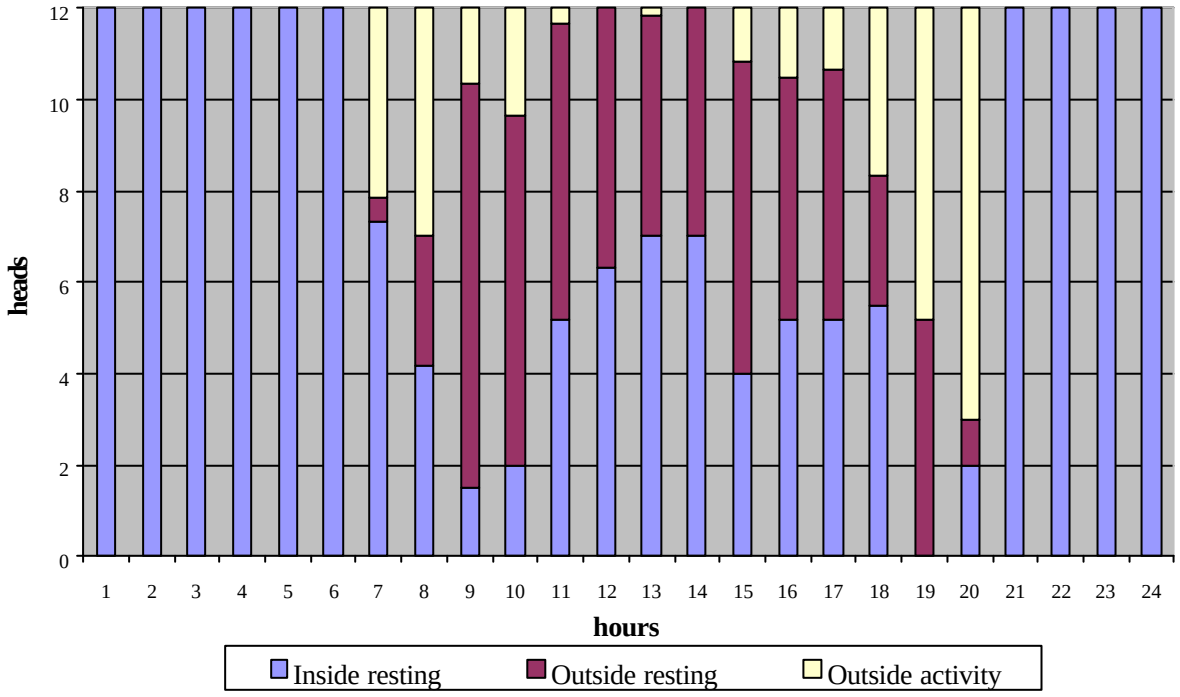


Fig. 7: Daily trends of the number of pigs resting and in activity in the typical behavioural summer day

CONCLUSIONS

On the basis of the results, it is possible to come to some conclusions.

- The feed/gain ratio is higher in the examined outdoor system than in indoor systems.
- The huts used during the trials enable to mitigate the outside temperatures in a rather limited way.
- In winter season it is advisable to arrange a partial closing of open side and to use great amounts of straw in order to give better thermal comfort to pigs, to reduce energy losses and to lower the feed/gain ratio.

- The open side exposed to West gives little better thermal comfort to the pigs than East exposition, both in winter conditions and in summer conditions.

The low feed conversion efficiency is a reflection of great losses of energy for outdoor activity and for thermoregulation.

Differences of inside temperature between the two huts with different exposition could be affected by cold or warm local breezes; therefore these differences should be related to the climatic conditions of the farm site.

The 83% of the time destined to resting, both in winter and in summer season, can be considered as indicative of good welfare conditions, taking into account that in outdoor enclosures the pigs are stimulated by a natural environment, where they can satisfy easily instinctive behaviours such as rooting and exploring.

The results confirm the technical feasibility of the outdoor system for growing-finishing pigs but also show the negative influences of climatic factors on the productive performances. For this reason the outdoor system for growing-finishing pigs may not compete economically with indoor system for conventional production but can be suggested for producing pigs directed to the organic market or to niche markets requiring high levels of animal welfare.

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